

Contents

Preface	ix
Acknowledgments	xiv

Part I: Installation 1

Chapter 1: Planning for Installation 3

Installation Strategy	5
Installation planning	5
Types of servers	6
Verifying OS Hardware Compatibility	11
Verifying Power Sources and UPS Installation	12
Location	12
Quality	12
Grounding	12
Uninterruptible power supply	13
Verifying Rack Space	13
Network Cabling and Connectors	14
Network topologies	14
Types of cable	16
Connectors	18
Cable location	19
Verifying Components	19
Assessment Questions	21
Scenarios	26
Answers to Chapter Questions	26
Chapter pre-test	26
Assessment questions	27
Scenarios	29

Chapter 2: Setting Up the Environment 31

Server Rack Installation	33
Preparing the rack for installation	33
Installing equipment in the rack	34
Preparing Network Cabling	35
Coaxial	35
Twisted-pair	35
Making the cable	38

Installing the UPS	39
Charging the UPS battery	40
Connecting the UPS	40
Configuring the UPS software	40
Testing the UPS	40
Assessment Questions	42
Scenarios	46
Answers to Chapter Questions	46
Chapter pre-test	46
Assessment questions	47
Scenarios	49

Chapter 3: Installing Hardware 51

Installing Hardware	53
Installing internal devices	53
Installing external devices	58
Verifying SCSI IDs and Termination	61
Host adapter	61
Verifying device numbers	61
Device cabling and termination	62
BIOS and Firmware Levels	62
BIOS	62
Firmware	63
Monitoring the Power-On Sequence	64
Power initialization	64
BIOS initialization	65
Power-on self test	65
Assessment Questions	69
Scenarios	73
Answers to Chapter Questions	73
Chapter pre-test	73
Assessment questions	74
Scenarios	77

Part II: Configuration

79

Chapter 4: Configuring RAID 81

The History of RAID	83
Mirroring and Parity	84
RAID Levels	84
RAID 0	84
RAID 1	85
RAID 2	87
RAID 3	87
RAID 4	88
RAID 5	88
RAID 6	89

Hybrid RAID Levels	89
RAID 0+1	89
RAID 30 and RAID 50	90
Hardware RAID and Software RAID	91
External RAID storage	92
PCI card RAID controllers	92
Embedded RAID controllers	92
RAID BIOS	92
Controller caching	92
Fibre Channel	93
Software RAID	93
RAID Disk Concepts	93
Assessment Questions	95
Scenarios	99
Answers to Chapter Questions	100
Chapter pre-test	100
Assessment questions	100
Scenarios	103

Chapter 5: Configuring the Operating System and Network 105

Examining the Documentation	107
Configuring the Disk	108
Installing the NOS	108
Microsoft Windows NT/2000	109
Novell NetWare	110
IBM OS/2	111
Unix	111
Configuring and Verifying Network Connectivity	113
NetBEUI and NetBIOS	113
Novell IPX/SPX	114
TCP/IP	114
Verifying network configuration	120
Applying Patches and Service Packs	122
Bug fixes	122
Functionality enhancements	123
Hardware driver support	123
Security fixes	123
Types of NOS updates	124
Finding updates	125
Installing a service pack	125
Updating major operating systems	127
Shutting Down the Operating System	129
Assessment Questions	131
Scenarios	135
Answers to Chapter Questions	136
Chapter pre-test	136
Assessment questions	136
Scenarios	139

Chapter 6: Using Services and Monitoring Tools 141

Using Tools and Services	143
Monitoring the network with SNMP	143
Using monitoring tools	145
Using event logs	155
Backing up the server	156
Performing a Server Baseline	158
Documenting the Configuration	159
Assessment Questions	161
Scenarios	164
Answers to Chapter Questions	164
Chapter pre-test	164
Assessment questions	164
Scenarios	166

Part III: Upgrading**167****Chapter 7: Upgrading Motherboard Components 169**

Backing up Before Upgrading	171
Central Processing Unit	172
CPU concepts	172
CPU architectures	173
Installing a CPU	176
System Memory	178
Basic types of server memory	178
Memory packaging types	180
Installing memory	181
System Bus Architectures	182
System bus concepts	183
I/O buses	185
Upgrading BIOS and Firmware	187
BIOS	187
Firmware	188
Performing an Upgrade Checklist	189
Assessment Questions	192
Scenarios	196
Answers to Chapter Questions	196
Chapter pre-test	196
Assessment questions	197
Scenarios	200

Chapter 8: Upgrading Storage Devices 201

IDE/ATA Hard Drives	203
IDE/ATA standards	203
IDE configuration	205
IDE cabling	207

SCSI Disk Systems	208
SCSI standards and technologies	208
Cables, connectors, and termination	211
SCSI configuration	213
Installing SCSI drives	215
SCSI configuration and upgrading issues	216
Upgrading SCSI RAID Systems	216
Configuring the OS to Recognize	
New Hard Disks	218
Assessment Questions	219
Scenarios	223
Answers to Chapter Questions	224
Chapter pre-test	224
Assessment questions	224
Scenarios	227

Chapter 9: Upgrading Cards and Peripherals 229

System Resources	231
IRQ	231
I/O addresses	233
Direct Memory Access	234
PCI plug-and-play	234
Expansion slots	234
Upgrading Network Interface Cards	234
Protocols	235
System bus issues	235
Cabling	236
Speed	236
Duplexing	236
Adaptive teaming	237
Installing a network card	238
Upgrading Peripheral Cards	239
SCSI adapters	239
Video cards	240
Sound cards	241
Tape drives	241
Upgrading UPS	242
UPS batteries	242
UPS software	242
Upgrading Diagnostic Tools and Utilities	243
Upgrading System Monitoring Tools	243
Assessment Questions	245
Scenarios	250
Answers to Chapter Questions	250
Chapter pre-test	250
Assessment questions	250
Scenarios	253

Part IV: Proactive Maintenance**255****Chapter 10: Monitoring Performance 257**

Performing Regular Backups	259
Backup performance	259
Improving backup performance	261
Record it	262
Creating a Baseline	262
Documenting performance	264
Taking a system snapshot	265
Measuring and Evaluating Performance	266
Thresholds	266
Processor	267
Memory	268
Storage	269
Network	270
Evaluating Overall Performance	271
Documenting Results	271
Assessment Questions	273
Scenarios	277
Answers to Chapter Questions	277
Chapter pre-test	277
Assessment questions	278
Scenarios	280

Chapter 11: Using Monitoring Agents 281

Monitoring Your Network with SNMP	283
How SNMP works	283
SNMP Management Information Base	284
SNMP commands	284
Setting SNMP thresholds	285
Hardware Monitoring Agents	286
Dedicated hardware	286
Software monitoring of server hardware	287
Third-Party Agents	287
Application Monitoring	289
Event Logs	289
Remote Notification	290
Network Analyzers	290
Identifying Bottlenecks	291
Assessment Questions	293
Scenarios	296
Answers to Chapter Questions	296
Chapter pre-test	296
Assessment questions	297
Scenarios	299

Chapter 12: Physical Housekeeping 301

Sights, Sounds, and Smells	303
Checking Status Lights	304
System power lights	305
Hardware diagnostic lights	305
Hard drive lights	305
Network card lights	305
Tape drive lights	306
Temperature and Ventilation	306
Internal air flow	307
External ventilation	307
Server Fans	308
Chip fan	308
Power supply fan	308
Chassis fan	309
Checking Cabling	309
Network cabling	309
Internal cabling	309
Keyboard, monitor, and mouse cables	309
Electrical Issues	310
Surge protection	310
Surge suppressor	310
Line conditioner	310
UPS	311
Assessment Questions	312
Scenarios	316
Answers to Chapter Questions	316
Chapter pre-test	316
Assessment questions	317
Scenarios	319

Part V: Security**321****Chapter 13: Securing the Environment 323**

Securing the Physical Site	325
Server room construction	325
Server room access	326
Locks	326
Access control systems	327
Biometric systems	328
Anti-theft devices	330
Securing Backup Tapes	331
Fireproof safes	331
Off-site storage	332
Disposing of Media	332
Documenting Security Measures	333
Assessment Questions	335

Scenarios	338
Answers to Chapter Questions	338
Chapter pre-test	338
Assessment questions	339
Scenarios	340

Chapter 14: Environmental Issues 341

Recognizing Environmental Issues	343
Temperature	343
Humidity level	344
Ventilation	345
Air conditioning	345
Air Pollutants	347
Air quality levels	348
Sources of contaminants	348
Filtration	349
Regular cleaning	349
Electrical Issues	351
Quality of power source	351
Proper grounding	352
Electrostatic discharge	352
Fire Safety	353
Fire extinguishers	353
Sprinkler systems	354
Non-liquid systems	354
Floods	354
Assessment Questions	357
Scenarios	359
Answers to Chapter Questions	359
Chapter pre-test	359
Assessment questions	360
Scenarios	361

Part VI: Troubleshooting

363

Chapter 15: Determining the Problem 365

Isolating the Problem	367
Troubleshooting methodology	367
Documentation	370
Know the network	373
Know the products	373
Logic and reasoning	373
Ask the right questions	374

Using Your Senses	375
Sight	375
Sound	375
Smell	376
Sensitivity	376
Checking Hardware	376
Checking server components	376
Checking lights	377
Checking cabling	378
Examining peripherals	379
Checking Software	379
Drivers	380
Dynamic Link Libraries	380
Software bugs	381
Troubleshooting the Operating System	381
System messages	381
Log files	382
Checking disk space	383
Checking for Viruses	384
Resolving the Problem	384
Assessment Questions	387
Scenarios	390
Answers to Chapter Questions	390
Chapter pre-test	390
Assessment questions	392
Scenarios	394

Chapter 16: Using Diagnostic Tools 395

Using the Right Tool	397
Hardware diagnostic tools	398
Software diagnostic tools	399
Troubleshooting Remotely	400
Remote access cards	400
Wake-on-LAN	401
Troubleshooting Resources	402
Server documentation	402
Using vendor resources	403
Technical support	404
Replacing Hardware	406
Documenting the Problem and Solution	407
Assessment Questions	409
Scenarios	414
Answers to Chapter Questions	414
Chapter pre-test	414
Assessment questions	415
Scenarios	418

Part VII: Disaster Recovery**419****Chapter 17: Planning for Disaster Recovery 421**

Forming a Disaster Recovery Plan	423
The disaster recovery team	424
Risk analysis	425
Business Impact Analysis	426
Prioritizing applications	427
Recovery requirements	428
The disaster recovery document	429
Types of Disasters	430
Natural disasters	430
Human error	430
Vandalism and sabotage	431
Hackers	431
Viruses	433
Planning for Redundancy	433
Hard drives	434
Power supplies	434
Network Interface Cards	436
Processors	436
Tape backup system	437
UPS	437
Ensuring Service	438
Hot site	438
Cold site	438
Backup Plan	439
Testing the Disaster Recovery Plan	440
Assessment Questions	442
Scenarios	445
Answers to Chapter Questions	445
Chapter pre-test	445
Assessment questions	446
Scenarios	448

Chapter 18: Ensuring Fault Tolerance 449

Recovering a RAID System	451
Disk failure	452
Recovering from a disk mirroring failure	453
Recovering from disk failure on a stripe set with parity	453
RAID drive state conditions	454

Ensuring High Availability	455
Hot swap	455
Warm swap	455
Hot spare	455
Raid controllers	455
Documenting Fault Tolerance	456
Assessment Questions	459
Answers to Chapter Questions	461
Chapter pre-test	461
Assessment questions	462

Chapter 19: Backing Up and Restoring 465

Planning the Backup	467
How critical is the data	467
How often to back up the system	468
How much data to back up	468
How long to store data	469
Which devices to back up	469
Types of Backup Hardware and Media	470
Backup media	470
Backup hardware	476
Types of Backups	477
Full backup	477
Incremental backup	478
Differential backup	478
Daily backup	479
Media Rotation Methods	479
Son rotation method	480
Father-son rotation method	480
Grandfather rotation method	481
Grandfather-father-son rotation method	482
Documenting Backup and Restoration Procedures	484
Assessment Questions	487
Scenarios	491
Answers to Chapter Questions	492
Chapter pre-test	492
Assessment questions	492
Scenarios	494

Appendix A: Exam Objective Mapping 495

Appendix B: Practice Exam 505

Appendix C: Test Taking Tips 535

Appendix D: What’s on the CD-ROM 541

Glossary 547

Index 561

End-User License Agreement 592

CD-ROM Installation Instructions 596